

Please print:

Last name: \_\_\_\_\_

First name: \_\_\_\_\_

**Chem 2061 Exam 2**

**Fall 2005**

**Andy Aspaas, Instructor**

**Friday, October 7, 2005**

**Instructions:**

**Time:** You have 55 minutes to complete this exam.

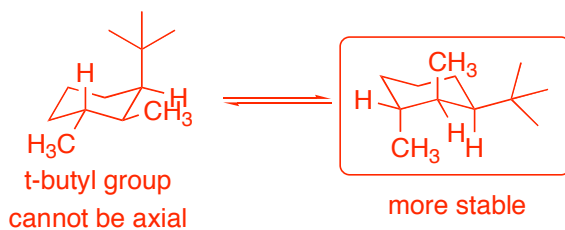
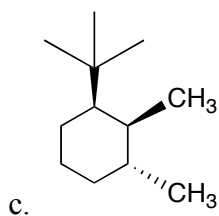
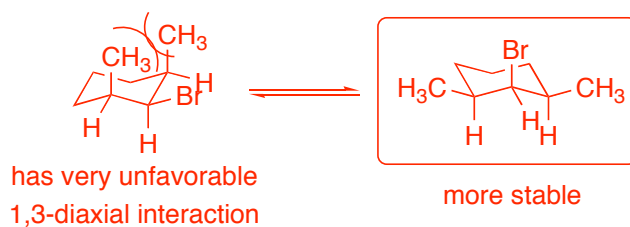
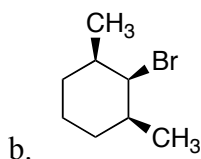
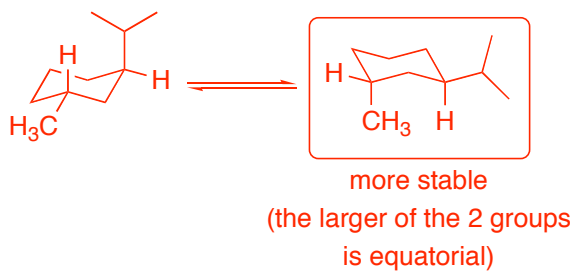
**You may use a model kit for this exam.**

I, \_\_\_\_\_ have read and understand the directions given above, and pledge that I will follow all regulations with regard to Academic Dishonesty as outlined by this college when taking this exam.

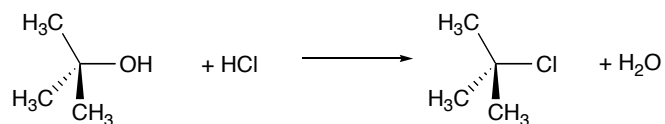
Signature \_\_\_\_\_ Date and Time \_\_\_\_\_

1. Draw a chair structure of the most stable conformation of the following molecules:

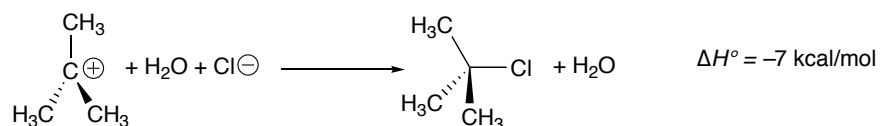
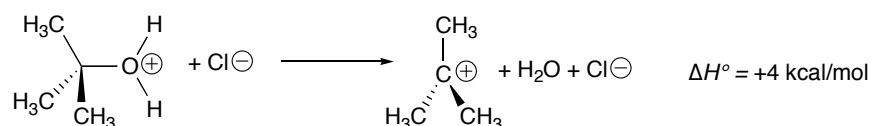
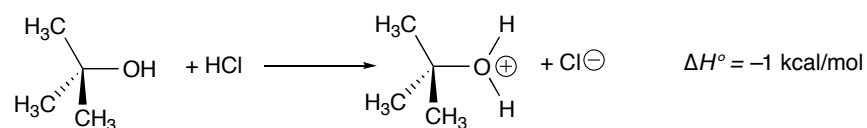
a. *trans*-1-isopropyl-3-methylcyclohexane



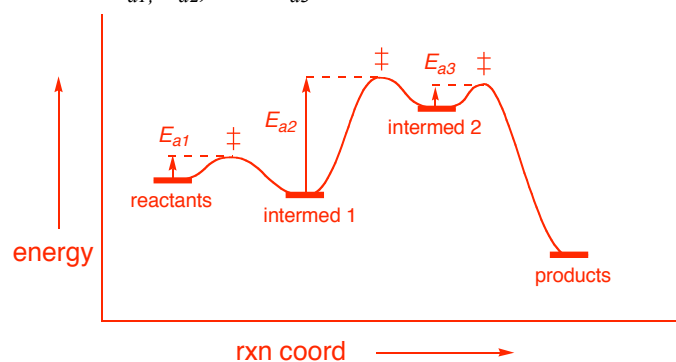
2. Consider the following overall reaction, which you have *not* seen before:



This reaction takes place in 3 steps, as follows:



- a.
- Draw a reaction-energy diagram for this reaction, assuming that endothermic steps have considerably higher activation energy than exothermic steps.
  - Label “reactants”, “intermediates 1”, “intermediates 2”, and “products”.
  - Draw double-daggers at the transition states.
  - Label  $E_{a1}$ ,  $E_{a2}$ , and  $E_{a3}$



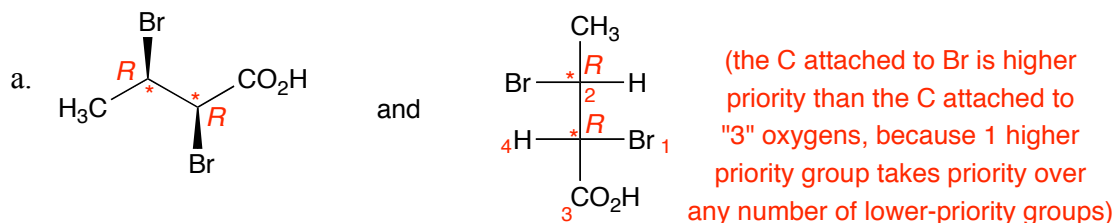
- b. Of the three steps, which is rate-limiting?

The 2nd because it has highest activation energy

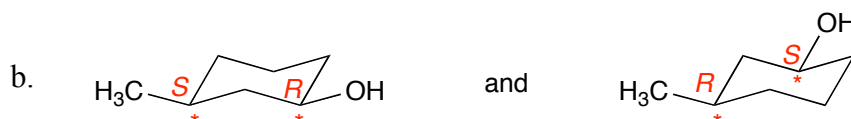
- c. What is the overall  $\Delta H^\circ$  for the reaction?

$$-1 + 4 - 7 = -4 \text{ kcal/mol}$$

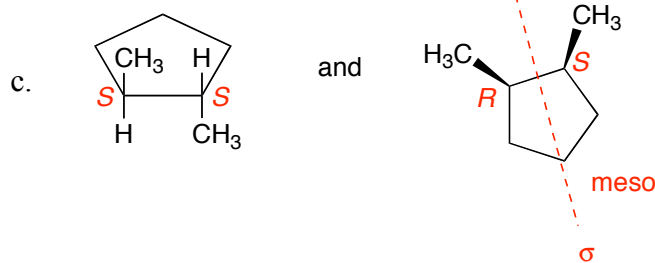
3. For the following pairs compounds,
- Star all asymmetric carbons
  - Assign all configurations (*R*) or (*S*)
  - Indicate whether the pairs are the same compound, enantiomers, diastereomers, or constitutional isomers.
  - If any compounds are meso, label them as such.



relationship: same compound



relationship: enantiomers



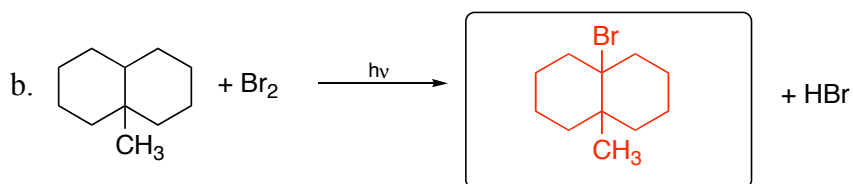
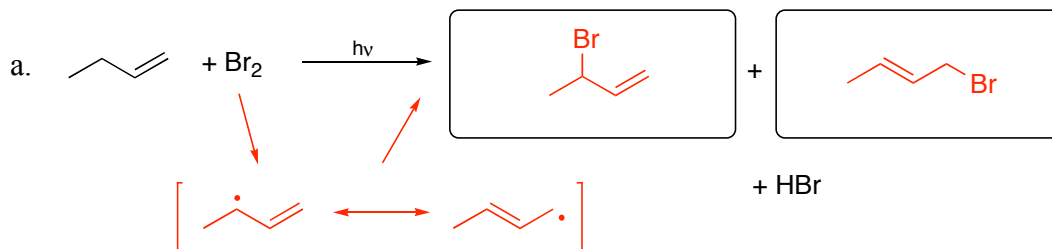
relationship: diastereomers

4. Consider the following molecule:
- Is it meso? Why/why not? Draw the mirror plane if it is.

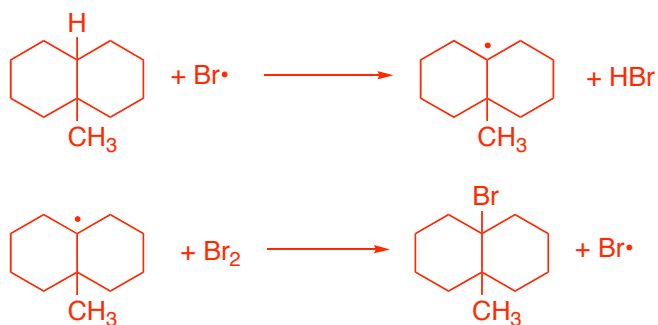
Yes, since it is achiral but has asymmetric carbons. (The technical definition of meso) - also accepted "no because there's no internal mirror plane"

- Is it chiral? Why/why not?  
No, its mirror image is superimposable.

5. Indicate the major product(s) for the following reactions:



c. Draw the two propagation steps for reaction b above.



d. When bonds are broken, energy is (absorbed / released). *Circle one.*

e. When bonds are formed, energy is (absorbed / released). *Circle one.*